Sub A1

THAT WHICH IS CLAIMED:

1. A method for design analysis of a component, the method comprising:

generating a finite element model of the component;

receiving user-defined parameters defining a plurality of variables associated with the component and including at least one thermo-mechanical environment parameter;

subjecting the finite element model of the component to at least one environmental load;

determining a stress response of the finite element model based upon the at least one environmental load;

determining whether the stress response is within pre-selected limits; and

prompting modification of at least one of a design of the component and at least one user-defined parameter and regenerating the finite element model if the stress response is outside of the pre-selected limits.

2. The method of claim 1, wherein determining whether the stress response is within pre-selected limits comprises converting the stress response of the finite element model to a fatigue life for the component and comparing the fatigue life for the component to a target fatigue life for the component.

3. The method of claim 2, wherein prompting modification comprises determining at least one of the design of the component and at least one user-defined parameter that causes the fatigue life for the component to be shorter than the target fatigue life for the component, if the fatigue life for the component is shorter than the target fatigue life for the component.

4. The method of claim 1, further comprising creating a drawing of a design of the component prior to generating the finite element model of the component.

5. The method of claim 4, wherein creating the drawing of the design of the component comprises creating a three-dimensional computer aided drawing of the design of the component.

6. The method of claim 4, wherein creating the drawing of the design of the component comprises creating a drawing of a design of electronics embedded in the component.

7. The method of claim 1, wherein receiving user-defined parameters defining a plurality of variables associated with the component comprises receiving at least one of at least one manufacturing parameter for the component, at least one boundary condition for the component, and part information for the component.

8. The method of claim 1, wherein receiving at least one thermo-mechanical environment parameter for the component comprises receiving at least one of a thermal environment parameter, an acoustic environment parameter, a vibration environment parameter, and a shock environment parameter.

9. The method of claim 1, further comprising receiving finite element properties and information regarding at least one part of the component.

10. The method of claim 9, wherein receiving information regarding at least one part of the component comprises receiving information from a database of parts information.

11. The method of claim 1, wherein subjecting the finite element model of the component to at least one environmental load comprises subjecting the finite element model of the component to at least one of a thermal environmental load, an acoustic environmental load, a vibration environmental load, and a shock environmental load.

12. The method of claim 1, further comprising storing the finite element model as a representation of the design for the component if the stress response is within the pre-selected limits.

13. The method of claim 1, wherein subjecting the finite element model of the component to at least one environmental load comprises:

subjecting the finite element model of the component to a computational first load;

subjecting the finite element model of the component to a computational second load;

determining a maximum response of the finite element model of the component to the first load;

determining a maximum response of the finite element model of the component to the second load;

determining a ratio of the maximum responses;

obtaining a first environmental load to test against the component;

applying the ratio of the maximum responses to the first environmental load to convert the first environmental load to a second environmental load; and

subjecting the finite element model to the second environmental load.

14. The method of claim 13, wherein determining a stress response of the finite element model based upon the at least one environmental load comprises determining the stress response of the finite element model based upon the second environmental load.

15. The method of claim 13, wherein obtaining the first environmental load to test against the component comprises obtaining one of an acoustic pressure load and an acceleration load, and wherein applying the ratio of the maximum responses to the first environmental load to convert the first environmental load to the second environmental load comprises converting the

first environmental load to the other of the acoustic pressure load and the acceleration load.

16. The method of claim 13, wherein subjecting the finite element model of the component to the computational first load comprises subjecting the finite element model of the component to a 1 psi uniform acoustic pressure load.

17. The method of claim 13, wherein subjecting the finite element model of the component to the computational second load comprises subjecting the finite element model of the component to a 1 g negative based acceleration load.

18. The method of claim 13, further comprising applying boundary conditions to the finite element model of the component prior to determining the maximum response of the finite element model of the component to the first load.

19. The method of claim 13, further comprising applying boundary conditions to the finite element model of the component prior to determining the maximum response of the finite element model of the component to the second load.

20. The method of claim 1, wherein subjecting the finite element model of the component to at least one environmental load comprises:

subjecting the finite element model of the component to a computational acoustic load;

applying boundary conditions to the finite element model;

determining a maximum pressure response of the finite element model to the acoustic load and the boundary conditions, wherein the maximum pressure response is based upon a selected sonic pressure load for testing against the component that is converted to a pressure power spectral density;

subjecting the finite element model to a computational acceleration load;

applying boundary conditions to the finite element model;

determining a maximum acceleration response of the finite element model to the acceleration load and the boundary conditions, wherein the maximum acceleration response is based upon a selected sonic pressure load for testing against the component that is converted to a pressure power spectral density;

determining a ratio of the maximum pressure response to the maximum acceleration response for the selected sonic pressure load;

applying the ratio of the maximum pressure response to the maximum acceleration response to the pressure power spectral density to convert the pressure power spectral density to an acceleration power spectral density;

generating an input for a shaker table according to the acceleration power spectral density;

securing the component to the shaker table;

applying the input to the shaker table; and

monitoring the response of the component to the input.

21. The method of claim 20, wherein subjecting the finite element model of the component to the computational acoustic load comprises subjecting the finite element model to a 1 psi uniform pressure load.

22. The method of claim 20, wherein subjecting the finite element model to the computational acceleration load comprises subjecting the finite element model to a 1 g negative base acceleration load.

23. An automated system for design analysis of a component, the system comprising:

a client element capable of receiving user-defined parameters defining a plurality of variables associated with the component and including at least one thermo-mechanical environment parameter, and said client element also

capable of receiving at least one of a modified design of the component and at least one modified user-defined parameter; and

a processing element responsive to said client element and capable of generating a finite element model of the component, said processing element also capable of automatically performing the design analysis based upon user-defined parameters defining a plurality of variables associated with the component and including at least one thermo-mechanical environment parameter without additional manual input by subjecting the finite element model of the component to at least one environmental load, determining a stress response of the finite element model based upon the at least one environmental load, and determining whether the stress response is within pre-selected limits; said processing element further capable of prompting modification of at least one of the design of the component and at least one user-defined parameter, and said processing element also capable of automatically regenerating the finite element model and automatically re-performing the design analysis based upon the at least one of the modified design of the component and at least one modified user-defined parameter without additional manual input if the stress response is outside of the pre-selected limits.

24. The system of claim 23, further comprising a storage element for storing the finite element model as a representation of the design for the component if the stress response is within the pre-selected limits.

25. The system of claim 23, wherein said processing element determines whether the stress response is within pre-selected limits by converting the stress response of the finite element model to a fatigue life for the component and comparing the fatigue life for the component to a target fatigue life for the component.

26. The system of claim 25, wherein said processing element is further capable of determining at least one of the design of the component and at least

one user-defined parameter that causes the fatigue life for the component to be shorter than the target fatigue life for the component, if the fatigue life for the component is shorter than the target fatigue life for the component.

27. The system of claim 23, wherein said client element receives user-defined parameters by receiving at least one manufacturing parameter for the component, at least one boundary condition for the component, and part information for the component.

28. The system of claim 23, wherein said client element receives at least one thermo-mechanical environment parameter for the component by receiving at least one of a thermal environment parameter, an acoustic environment parameter, a vibration environment parameter, and a shock environment parameter.

29. The system of claim 23, wherein said client element is further capable of receiving finite element properties and information regarding at least one part of the component.

30. The system of claim 29, wherein said client element receives information regarding at least one part of the component from a database of parts information.

31. The system of claim 23, wherein said processing element subjects the finite element model of the component to at least one environmental load by subjecting the finite element model of the component to at least one of a thermal environmental load, an acoustic environmental load, a vibration environmental load, and a shock environmental load..

32. The system of claim 23, wherein said client element is further capable of receiving a drawing of a design of the component.

33. The system of claim 32, wherein said client element receives the drawing of the design of the component by receiving a three-dimensional computer aided drawing of the design of the component.

34. The system of claim 32, wherein said client element receives the drawing of the design of the component by receiving a drawing of a design of electronics embedded in the component.

35. The system of claim 23, wherein said processing element subjects the finite element model of the component to at least one environment by:

subjecting the finite element model of the component to a computational first load;

subjecting the finite element model of the component to a computational second load;

determining a maximum response of the finite element model of the component to the first load;

determining a maximum response of the finite element model of the component to the second load;

determining a ratio of the maximum responses;

obtaining a first environmental load to test against the component;

applying the ratio of the maximum responses to the first environmental load to convert the first environmental load to a second environmental load; and

subjecting the finite element model to the second environmental load.

36. The system of claim 35, wherein said processing element determines the stress response of the finite element model based upon the at least one environmental load by determining the stress response of the finite element model based upon the second environmental load.

37. The system of claim 35, wherein said processing element obtains the first environmental load to test against the component by obtaining one of an

acoustic pressure load and an acceleration load, and wherein said processing element applies the ratio of the maximum responses to the first environmental load to convert the first environmental load to the second environmental load that is the other of the acoustic pressure load and the acceleration load.

38. The system of claim 35, wherein said processing element subjects the finite element model of the component to a computational first load by subjecting the finite element model of the component to a 1 psi uniform acoustic pressure load.

39. The system of claim 35, wherein said processing element subjects the finite element model of the component to a computational second load by subjecting the finite element model of the component to a 1 g negative based acceleration load.

40. The system of claim 35, wherein said processing element is further capable of applying boundary conditions to the finite element model of the component prior to determining the maximum response of the finite element model of the component to the first load.

41. The system of claim 35, wherein said processing element is further capable of applying boundary conditions to the finite element model of the component prior to determining the maximum response of the finite element model of the component to the second load.

42. The system of claim 23, wherein said processing element subjects the finite element model of the component to at least one environment by:

subjecting the finite element model of the component to a computational acoustic load;

applying boundary conditions to the finite element model;

determining a maximum pressure response of the finite element model to the acoustic load and the boundary conditions, wherein the maximum

pressure response is based upon a selected sonic pressure load for testing against the component that is converted to a pressure power spectral density;

subjecting the finite element model to a computational acceleration load;

applying boundary conditions to the finite element model;

determining a maximum acceleration response of the finite element model to the acceleration load and the boundary conditions, wherein the maximum acceleration response is based upon a selected sonic pressure load for testing against the component that is converted to a pressure power spectral density;

determining a ratio of the maximum pressure response to the maximum acceleration response for the selected sonic pressure load;

applying the ratio of the maximum pressure response to the maximum acceleration response to the pressure power spectral density to convert the pressure power spectral density to an acceleration power spectral density;

generating an input for a shaker table according to the acceleration power spectral density;

applying the input to the shaker table upon which the component is secured; and

monitoring the response of the component to the input.

43. The system of claim 42, wherein said processing element subjects the finite element model of the component to the computational acoustic load by subjecting the finite element model of the component to a 1 psi uniform pressure load.

44. The system of claim 42, wherein said processing element subjects the finite element model of the component to the computational acceleration load by subjecting the finite element model of the component to a 1 g negative base acceleration load.

45. A computer program product for automated design analysis of a component, the computer program product comprising a computer-readable storage medium having computer-readable program code portions stored therein, the computer-readable program code portions comprising:

a first executable portion capable of receiving user-defined parameters associated with the component and including at least one thermo-mechanical environment parameter;

a second executable portion capable of generating a finite element model of the component;

a third executable portion capable of automatically performing design analysis based upon the user-defined parameters associated with the component and including at least one thermo-mechanical environment parameter, the finite element properties, and the information regarding at least one part of the component without further manual input by subjecting the finite element model of the component to at least one environmental load, determining a stress response of the finite element model based upon the at least one environmental load, and determining whether the stress response is within pre-selected limits; and

a fourth executable portion capable of prompting modification of at least one of the design of the component and at least one user-defined parameter, said fourth executable portion also capable of regenerating the finite element model if the stress response is outside of the pre-selected limits.

46. The computer program product of claim 45, wherein said third executable portion determines whether the stress response is within pre-selected limits by converting the stress response of the finite element model to a fatigue life for the component and comparing the fatigue life for the component to a target fatigue life for the component.

47. The computer program product of claim 46, wherein said third executable portion is further capable of determining at least one of the design of the component and at least one user-defined parameter that causes the

fatigue life for the component to be shorter than the target fatigue life for the component, if the fatigue life for the component is shorter than the target fatigue life for the component.

48. The computer program product of claim 45, wherein said first executable portion receives user-defined parameters by receiving at least one manufacturing parameter for the component, at least one boundary condition for the component, and part information for the component.

49. The computer program product of claim 45, wherein said first executable portion receives at least one thermo-mechanical environment parameter for the component by receiving at least one of a thermal environment parameter, an acoustic environment parameter, a vibration environment parameter, and a shock environment parameter.

50. The computer program product of claim 45, wherein said first executable portion is also capable of receiving finite element properties and information regarding at least one part of the component.

51. The computer program product of claim 50, wherein said first executable portion receives information regarding at least one part of the component from a database of parts information.

52. The computer program product of claim 45, wherein said third executable portion subjects the finite element model of the component to at least one environmental load by subjecting the finite element model of the component to at least one of a thermal environmental load, an acoustic environmental load, a vibration environmental load, and a shock environmental load.

53. The computer program product of claim 45, wherein said first executable portion is further capable of receiving a drawing of a design of the component.

54. The computer program product of claim 53, wherein said first executable portion receives the drawing of the design of the component by receiving a three-dimensional computer aided drawing of the design of the component.

55. The computer program product of claim 53, wherein said first executable portion receives the drawing of the design of the component by receiving a drawing of a design of electronics embedded in the component.

56. The computer program product of claim 45, further comprising a fifth executable portion for storing the finite element model as a representation of the design for the component if the stress response is within the pre-selected limits.

57. The computer program product of claim 45, wherein said third executable portion subjects the finite element model of the component to at least one environment by:

subjecting the finite element model of the component to a computational first load;

subjecting the finite element model of the component to a computational second load;

determining a maximum response of the finite element model of the component to the first load;

determining a maximum response of the finite element model of the component to the second load;

determining a ratio of the maximum responses;

obtaining a first environmental load to test against the component;

applying the ratio of the maximum responses to the first environmental load to convert the first environmental load to a second environmental load; and

subjecting the finite element model to the second environmental load.

58. The computer program product of claim 57, wherein said third executable portion determines the stress response of the finite element model based upon the at least one environmental load by determining a stress response of the finite element model based upon the second environmental load.

59. The computer program product of claim 57, wherein said third executable portion obtains the first environmental load to test against the component by obtaining one of an acoustic pressure load and an acceleration load, and wherein said third executable portion applies the ratio of the maximum responses to the first environmental load to convert the first environmental load to the second environmental load that is the other of the acoustic pressure load and the acceleration load.

60. The computer program product of claim 57, wherein said third executable portion subjects the finite element model of the component to the computational first load by subjecting the finite element model of the component to a 1 psi uniform acoustic pressure load.

61. The computer program product of claim 57, wherein said third executable portion subjects the finite element model of the component to the computational second load by subjecting the finite element model of the component to a 1 g negative based acceleration load.

62. The computer program product of claim 57, wherein said third executable portion is further capable of applying boundary conditions to the

finite element model of the component prior to determining the maximum response of the finite element model of the component to the first load.

63. The computer program product of claim 57, wherein said third executable portion is further capable of applying boundary conditions to the finite element model of the component prior to determining the maximum response of the finite element model of the component to the first load.

64. The computer program product of claim 45, wherein said third executable portion subjects the finite element model of the component to at least one environment by:

subjecting the finite element model of the component to a computational acoustic load;

applying boundary conditions to the finite element model;

determining a maximum pressure response of the finite element model to the acoustic load and the boundary conditions, wherein the maximum pressure response is based upon a selected sonic pressure load for testing against the component that is converted to a pressure power spectral density;

subjecting the finite element model to a computational acceleration load;

applying boundary conditions to the finite element model;

determining a maximum acceleration response of the finite element model to the acceleration load and the boundary conditions, wherein the maximum acceleration response is based upon a selected sonic pressure load for testing against the component that is converted to a pressure power spectral density;

determining a ratio of the maximum pressure response to the maximum acceleration response for the selected sonic pressure load;

applying the ratio of the maximum pressure response to the maximum acceleration response to the pressure power spectral density to convert the pressure power spectral density to an acceleration power spectral density;

generating an input for a shaker table according to the acceleration power spectral density;

applying the input to the shaker table upon which the component is secured; and

monitoring the response of the component to the input.

65. The computer program product of claim 64, wherein said third executable portion subjects the finite element model of the component to the computational acoustic load by subjecting the finite element model of the component to a 1 psi uniform pressure load.

66. The computer program product of claim 64, wherein said third executable portion subjects the finite element model of the component to the computational acceleration load by subjecting the finite element model of the component to a 1 g negative base acceleration load.